

THE FOOD HABITS OF THE INDIAN HARE, *LEPUS NIGRICOLLIS*, IN CHATRI FOREST, AMRAVATI, MAHARASHTRA¹

J. H. SABNIS²

This study has attempted to ascertain the food of the Indian Hare by an examination of its faecal pellets collected in a square kilometre in the Chatri forest near Amravati, Maharashtra. 73.34% of the food has been found to consist of various grasses and the rest of other plants, all with a high moisture content.

INTRODUCTION

In the wild, it is very difficult to determine the food of herbivores except by watching and/or killing them. One important and relatively unworked method in India is by faecal analysis (Koppikar and Sabnis 1976, 1979). Although the hare has been a part of the Indian countryside for hundreds of years and has been known to compete for food with domestic stock and wild herbivores, the influence which they exert on vegetation has received scant attention. The need for studying the eco-biology of wild herbivores in general and the hare *Lepus nigricollis* in particular prompted me to undertake this investigation of the food spectrum and its habitat on the basis of epidermal remains of plants found in its faeces. This paper presents data on the food preferences and the relation of their abundance or otherwise with the population of the animal.

METHODS

The study was commenced in October 1978 in the Chatri forest and continued upto June 1979. Five trips per month, 45 in all, were

made at approximate intervals of about a week, and fresh samples collected over an area of one square kilometre.

The plants occurring in the area were collected and identified. A set of illustrations showing the structural pattern of the epidermis of each kind of leaf was prepared by peeling the surface and mounting on slides in glycerine. The structural peculiarities of the epidermis were drawn with a camera lucida. From each set of droppings, five pellets were soaked in water for 2 days, allowed to disintegrate and then thoroughly mixed. The epidermal remains were teased out and mounted on temporary glycerine slides and then compared and matched with the illustrations by microscopic examination. The plant remains in 25 sets of droppings were examined and identified each month and used for calculating the monthly percentage of the different species consumed.

At approximately monthly intervals, five pasture samples were cut to ground level, weighed on a spring balance and then sorted by hand into component species in the laboratory. Each plant species was then weighed and dried in an oven for determining its water content.

OBSERVATIONS

Physiography. The study area in the Chatri forest near Amravati, Maharashtra State,

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² Department of Zoology, Vidarbha Mahavidyalaya, Amravati, 444 604, India.

(20°56'N. 77°47'E.) has on its eastern side a hilly tract of reserved and open forest rising above c 400 m. Chatri forest and the area studied form the westward slope of these hills. with an elevation between 350 to 400 m. The climatic conditions are uniform throughout the year. The average rainfall is 653 mm per year. The minimum and maximum temperatures fluctuate between 10°C and 20°C during winter and 35°C and 45°C during summer.

Vegetation. The habitat is a degraded dry deciduous forest due to biotic or bio-edaphic

leana, Setaria tomentosa, Cynodon dactylon and *Aristida adscensionis*.

i) Production of pasture

The procedure is detailed under 'Methods' above and an attempt was made to study the plots naturally grazed upon by wild and domestic animals. The dry weight of the pasture was ascertained to compare the amount of pasture available at different times but no attempt was made to calculate the sustaining capacity of the habitat. No sample area was used a second time. The data in Table I re-

TABLE I

WEIGHT (IN GM) OF PASTURE IN SAMPLE AREAS (60×60 CM) GRAZED UPON BY HARE AND CATTLE

Condition of Habitat	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
(Moderately) grazed	290	250	235	225	230	215	188	165	187
Medium grazed	256	135	125	125	115	115	85	69	70
Over-grazed	70	48	30	49	35	25	21	22	27

interferences. (This feature is characteristic of Chatri hare habitat). The hills in general appear barren but a few areas have patchy vegetation. There is comparatively thicker forest on the eastern side.

Dry deciduous scrub forests is available at the base of the hillocks, where there is intense grazing by wild and domestic animals, and which has resulted in deciduous shrub. The permanent species are *Acacia leucophloea*, *A. catechu*, *Zizyphus jujuba*, *Mimosa hamata*, *Gymnosporia montana*, *Butea monosperma* and *Lantana camara*.

The common ephemeral species are represented by *Triumfetta rhomboidea*, *Solanum xanthocarpum*, *Heylandia latebrosa*, *Indigofera linifolia*, *Ludwigia parviflora*, *Tridax procumbens*, *Euphorbia pulcherrima*, *Crotalaria hirsuta*, *Justicia simplex*, *Ocimum canum*, *Atylosia scarabaeoides*, *Enicostema littorale*, *Vicoa auriculata*, and *Cassia tora*.

The grasses are represented *Iseilema antheroides*, *Ischaemum pilosum*, *Digitaria roy-*

presents the total weight of plant cover on the ground sampled.

ii) Water content of palatable plants

The differences in the water content of the different plants had considerable influence on their palatability for the hare. Table II lists the seasonal variations in water content of the plants grazed upon. The water content of some plants falls below 60% in late winter and summer (March to June) when it appears from data available that it is insufficient, and prompts the hare to change its food.

In summer, this leads to an active search for anything green (and at this time almost anything that was green was eaten) and the summer grasses were subject to severe grazing pressure. This behaviour is supported by presence of fresh faecal matter being largely located on the banks of the dry streams, which held patches of green grass.

The number of droppings varies in different months and suggests that it may be due to changes in population numbers caused by local

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TABLE II

PERCENTAGE OF WATER CONTENT OF PALATABLE PLANT

Species	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
<i>Iseilema anthepliorides</i>	68.42	65.35	66.49	63.68	65.35	54.37	54.38	—	—
<i>Ischaemum pilosum</i>	82.76	78.84	78.55	64.46	66.73	55.35	53.58	52.58	50.62
<i>Cynodon dactylon</i>	60.83	58.68	65.67	62.37	56.69	55.85	54.37	58.33	62.67
<i>Heylandia latebrosa</i>	82.57	75.65	66.33	59.66	—	—	—	—	—
<i>Euphorbia pulcherrima</i>	85.50	79.35	76.54	78.39	75.65	72.58	72.33	68.69	64.33
<i>Indigofera linifolia</i>	66.38	63.87	63.45	62.31	62.16	61.33	60.19	60.35	58.89
<i>Ludwigia parviflora</i>	—	—	—	—	72.72	68.18	66.29	62.33	60.87
<i>Sonchus arvensis</i>	89.79	74.19	75.49	73.38	72.72	75.15	68.71	58.66	58.26

migration. Fresh faecal pellets which glisten because of a mucus covering are olive green. They turn to black in a week's time and older ones are bleached to pale grey or almost white. Each set consisted of 11 to 30 pellets and comparison with rectal pellets taken in freshly killed animals confirmed that the rectum is fully evacuated in every single defaecation. The presence of more than one set of fresh droppings in small area therefore indicates the presence of more than one individual. The droppings of the young can be separated by their smaller size—adults 1.3 cm in length and 395 mg in weight, cf. 3 mm and 75 mg in the young.

is no clear-cut breeding season, and young may be found throughout the year. Mr. H. Abdulali (Pers. Comm.) confirms that in his experience he has seen pregnant females shot during December to March.

Food:

Table IV reveals the variety of plants eaten by the hare. A few species of grass are the most constant food of the hare, and were found in 77.34 per cent of the faeces examined. The occurrence of their own hair is no doubt due to their constant habit of licking and cleaning their body.

Immediately after the monsoon, the period October to December is rich in food for the

TABLE III

MONTHLY POPULATION IN PERCENTAGE OF ADULT AND YOUNG ANIMALS ON BASIS OF PELLET SIZE

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Adult	62.66	50	62.05	53.13	75.13	68.00	68.79	70.28	62.05
Young	37.84	50	37.05	46.87	24.83	32.00	31.21	29.72	37.05

From Table III it will be noted that the number of young (estimated on the proportion of small droppings) increases from 37.84 in October to 46.87 in January but then drops to 29.72 in May. The Wild Animals (Protection) Act, 1971 in Maharashtra protected the hare along with other Small Game from 1st April to 30th September, but it is evident that there

hare, and vegetation is still in the growing state. Not all the plants in the environment were found in the faeces. The predominant grass species are *Iseilema anthepliorides*, *Ischaemum pilosum*, *Digitaria royleana*. Other plants grazed upon are *Heylandia latebrosa*, *Indigofera linifolia* and *Cynthocline lyrata*. Species observed to have been grazed by hare

TABLE IV

FREQUENCY OF OCCURRENCE OF DIFFERENT ITEMS IN THE FAECES OF 225 HARE, OCT.-MAY

Species	Frequency in faeces %
A Grass, all species	77.34
<i>Iseilema anthepliorides</i>	50.00
<i>Digitaria royleana</i>	20.00
<i>Ischaemum pilosum</i>	50.00
<i>Setaria tomentosa</i>	16.66
<i>Aristida adscensionis</i>	6.66
<i>Cynodon dactylon</i>	36.66
B Other Plants	22.66
<i>Heylandia latebrosa</i>	26.66
<i>Indigofera linifolia</i>	55.00
<i>Cynthocline lyrata</i>	50.00
<i>Ludwigia parviflora</i>	35.00
<i>Sonchus arvensis</i>	10.00
<i>Euphorbia pulcherrima</i>	28.33
<i>Tridax procumbens</i>	36.66
<i>Zizyphus jujuba</i> seed	18.33
Hairs of hare	38.33

TABLE V

SEASONAL VARIATION IN PERCENTAGE OF FOOD PLANTS BASED ON FAECAL ANALYSIS (25 SETS PER MONTH)

Food Items	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Grass									
<i>Iseilema</i>									
<i>anthepliorides</i>	100	85.71	71.43	100	62.05	40	—	12.05	—
<i>Ischaemum pilosum</i>	71.42	57.14	57.14	75	37.05	20	22.22	—	—
<i>Digitaria royleana</i>	57.14	42.85	42.85	25	50	—	11.11	62.05	—
<i>Setaria tomentosa</i>	—	—	—	—	—	—	33.33	37.05	12.50
<i>Cynodon dactylon</i>	—	—	—	—	—	—	66.66	62.05	62.50
<i>Aristida adscensionis</i>	—	—	—	—	37.05	20	—	—	—
Other plants									
<i>Heylandia latebrosa</i>	57.14	71.42	71.43	—	—	—	—	—	—
<i>Indigofera linifolia</i>	42.85	57.44	57.14	75	62.05	60	55.55	50	50
<i>Cynthocline lyrata</i>	28.56	42.85	28.57	75	50	60	22.22	75	62.05
<i>Ludwigia parviflora</i>	—	—	—	—	50	80	33.33	—	75
<i>Sonchus arvensis</i>	—	—	—	50	37.50	20	—	50	—
<i>Euphorbia pulcherrima</i>	—	—	—	50	—	60	44.44	50	50
<i>Tridax procumbens</i>	—	—	57.14	50	37.50	25	33.35	50	52.05
<i>Zizyphus jujuba</i> seed	—	—	—	75	50	50	—	—	—
Hairs of hare	28.56	37.05	42.85	25	25	40	44.44	37.05	37.50

during the period of investigation from October to June are given in Table V. The food preference is more or less similar for the winter months.

The summer is the driest and most critical period. The entire terrain goes dry. The hare has to travel long distances in search of green food. The patchy green grassy vegetation is now available only on the banks of dry streams intermittently at distances of 100 to 500 metres.

The predominant summer grass is *Cynodon dactylon*, and the plants *Euphorbia pulcherrima*, *Ludwigia parviflora*, *Indigofera linifolia*, and *Tridax procumbens* are now largely consumed. The importance of availability appears to be illustrated in the seasonal variations in the kind of plants consumed by them.

DISCUSSION

It is usually more satisfactory to measure in one specimen the percentage volume of each food item against the total content (McAtee 1912). This procedure has the advantage of showing accurately what an animal has ingested but the disadvantage that the animal must usually be killed, thus the information obtained is about only one meal or part of meal. Nevertheless considerable information on the food habits of animals has been obtained in this manner (Henderson 1927, McAtee 1912, Davison 1940, Indurkar and Sabnis 1976, and Sabnis and Kolhatkar 1977).

There are usually indigestible parts in all kinds of food and these indigestible or undigested parts are eliminated from the body. The contents of faecal droppings or regurgitated pellets can be identified by differences in shape, size, colour or histological and hair

structure (Dusi 1949, Koppikar and Sabnis 1977).

The droppings must as far as possible be collected fresh as they quickly disintegrate in wet weather. However as far as plant tissue remains are concerned these do not offer any such difficulty. A considerable advantage of pellet analysis is the possibility of a continuous diet analysis of the same animal or species through long periods of time without disturbance to its normal behaviour (Dalk 1935, Erington 1932, and Koppikar and Sabnis 1979). Among methods so far described above the faecal analysis is best suited for food studies of species which it is not desired to kill in large numbers.

The present study carried out over a short period does not claim to establish the quantities or overall food of the hare, but it is hoped that the data indicating seasonal preferences of vegetable food will assist further studies of this and other herbivores which have been sadly neglected in this country.

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